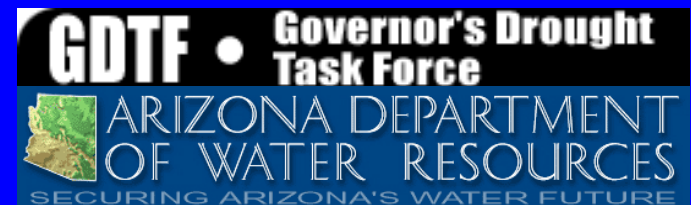


Drought Monitoring Technical Committee Report

to the
Arizona Interagency Coordinating Group

April 4, 2006

Tony Haffer
National Weather Service
Phoenix



Arizona Drought Monitoring Technical Committee



ARIZONA DIVISION OF
EMERGENCY MANAGEMENT



OFFICE OF THE ARIZONA
STATE CLIMATOLOGIST

Components of Drought Risk Management

$$\text{Risk} = \boxed{\text{Hazard}} \times \text{Vulnerability}$$

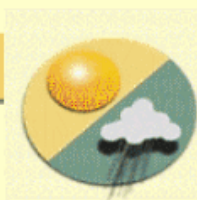
(natural event) (social factors)

**Monitoring
Committee**

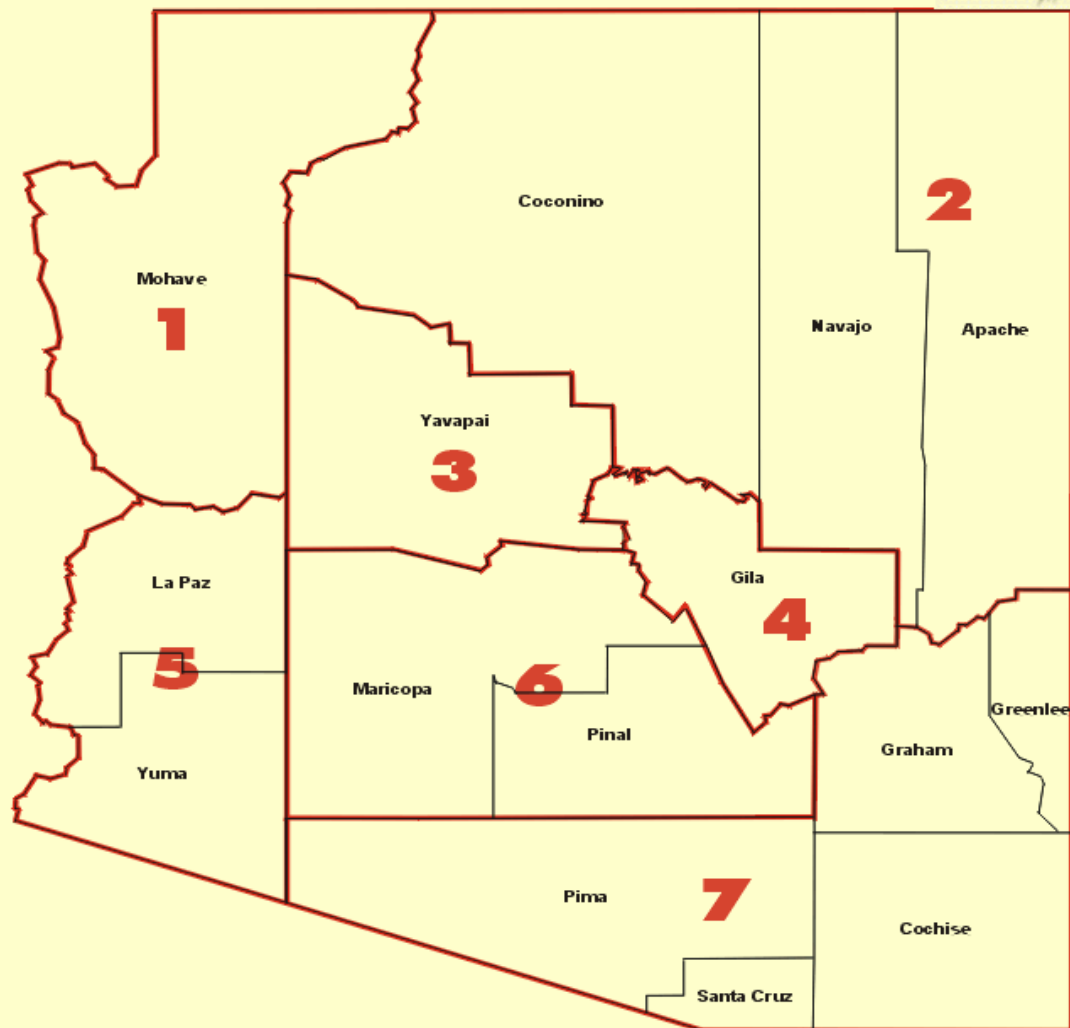
Drought Monitoring Philosophy

- Climate Divisions
 - Big Picture – raise the initial flag
 - Long-Term data – comparison with past
- Multiple Drought Types and Maps
- Incorporate short period of record and qualitative data
 - Corroborate status and enhance spatial precision

Climate Prediction Center



Arizona



Drought *Indicators*

Data to Describe Drought Conditions

- For Example: Precipitation, Snowpack, Streamflow, Groundwater, Drought indices

Drought *Triggers*

Specific Values of the Indicators that Initiate and Terminate Drought Levels and Management Responses

Level	Description	Percentile
0	No Drought	40.1-100.0%
1	Abnormally Dry	25.1-40.0%
2	Moderate Drought	15.1-25.0%
3	Severe Drought	5.1-15.0%
4	Extreme Drought	0.0-5.0%

Drought *Trigger* Goals

- Advance Warning going in to Drought
- *Cautious* coming out of Drought
- Smooth transitions between Drought Levels
 - Avoid jumping in and out of Drought from Month to Month
- Consistency with Historical Impacts

Trigger Sequence

Drought *In* and *Out* Triggers

IN: When Average of the Indicators is at a certain (or *more* severe) Level for 2 Consecutive Months

OUT: When Average of the Indicators is at a certain (or *less* severe) Level for 4 Consecutive Months

Indicators and Triggers



Short-Term					Long-Term												
Date	SPI_3_In	SPI_6_In	SPI_12_In	Final Drought Level	Date	SPI_24_In	SPI_36_In	SPI_48_In	Blue R. nr. Clifton	SF R. nr. Clifton	Gila R. nr. Solomon	San Pedro Palominas	San Pedro Charleston	Aravaipa Ck. Mammoth	Santa Cruz Lochiel	Leslie Ck. McNeal	Final Drought Level
Jul-03	2	1	2	2	Jul-03	4	1	2	2	2	1	2	3	2	2	2	3
Aug-03	2	1	2	2	Aug-03	4	1	2	2	4	4	1	2	2	4	2	3
Sep-03	2	3	2	3	Sep-03	4	2	3	2	4	4	1	2	2	4	3	3
Oct-03	2	3	2	3	Oct-03	4	2	3	2	2	3	3	2	2	3	3	3
Nov-03	1	2	2	2	Nov-03	4	3	3	2	2	3	3	3	2	3	3	3
Dec-03	1	2	2	2	Dec-03	3	3	2	2	2	2	3	4	2	3	3	3
Jan-04	1	2	2	2	Jan-04	3	3	2	2	2	2	3	4	2	3	3	3
Feb-04	1	1	2	2	Feb-04	3	3	2	2	1	1	3	4	2	3	3	3
Mar-04	1	1	2	2	Mar-04	3	3	2	2	1	1	2	4	2	2	3	3
Apr-04	0	1	2	1	Apr-04	3	3	2	0	0	0	2	3	2	2	3	2
May-04	0	0	1	1	May-04	2	3	1	0	0	0	1	3	2	2	3	2
Jun-04	0	0	1	1	Jun-04	2	3	1	1	1	0	1	3	4	2	3	2

Precipitation Comparison

(through March 1st)

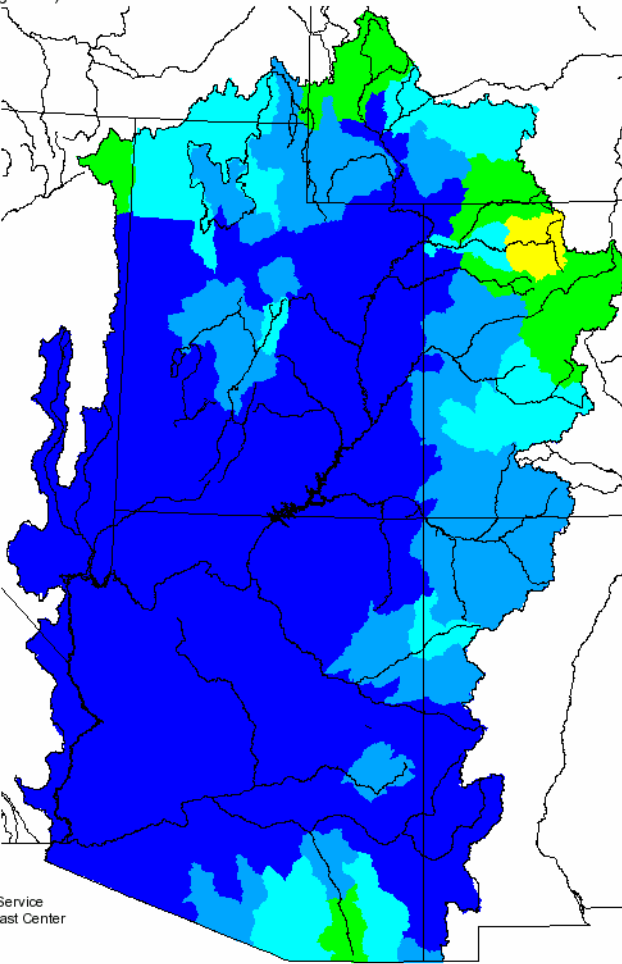
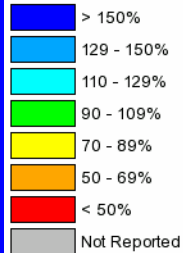
One Year Ago

This Year

Seasonal Precipitation, October 2004 - February 2005

(Averaged by Hydrologic Unit)

% Average

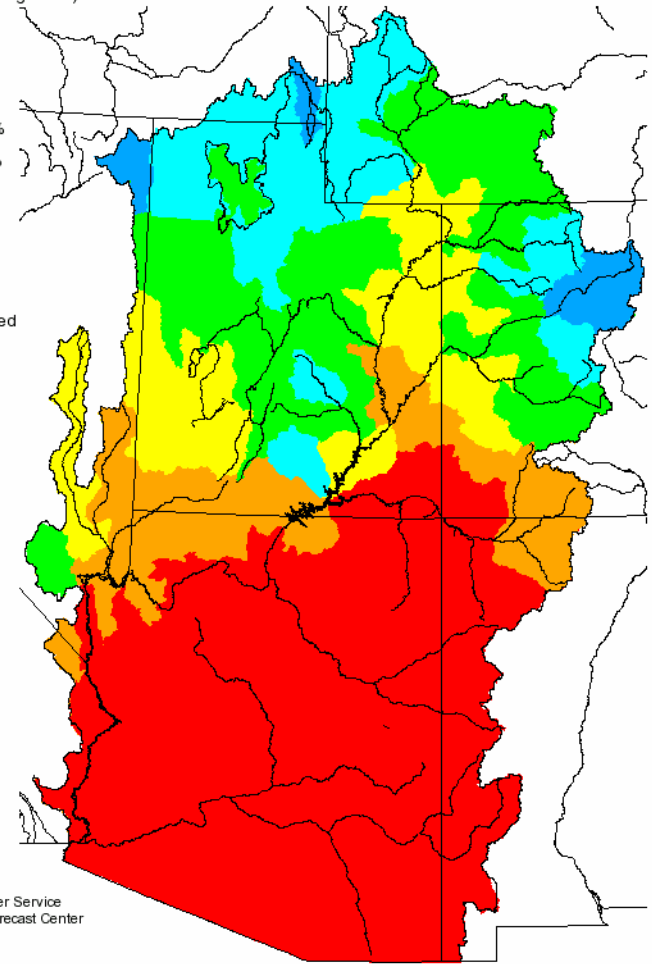
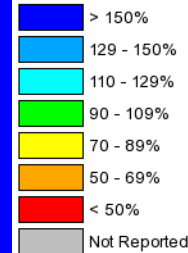


Prepared by
NOAA, National Weather Service
Colorado Basin River Forecast Center
Salt Lake City, Utah
www.cbrfc.noaa.gov

Seasonal Precipitation, October 2005 - February 2006

(Averaged by Hydrologic Unit)

% Average



Prepared by
NOAA, National Weather Service
Colorado Basin River Forecast Center
Salt Lake City, Utah
www.cbrfc.noaa.gov

Precipitation Comparison

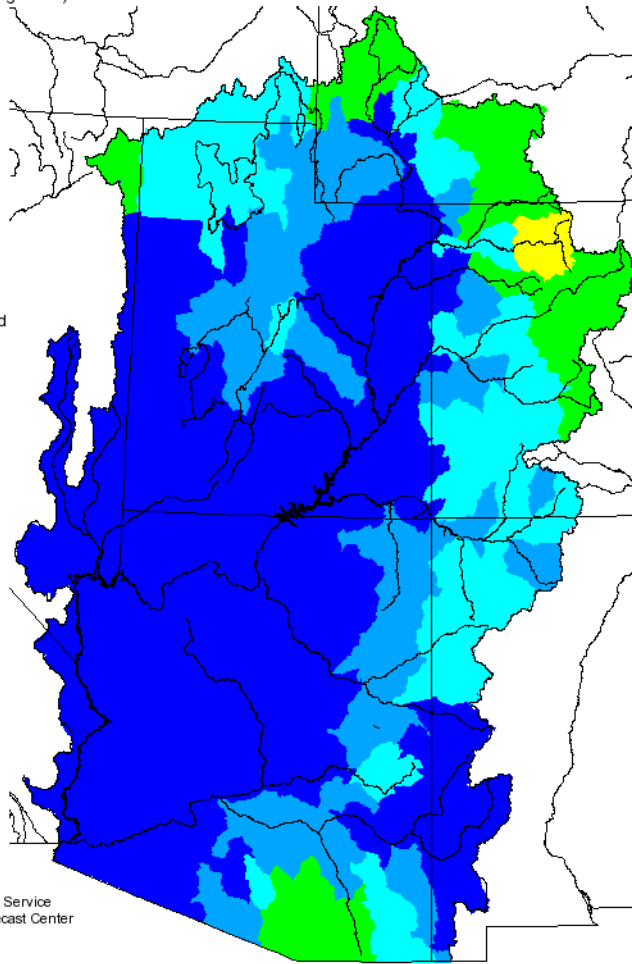
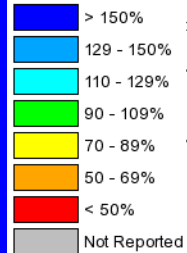
(through April 1st)

One Year Ago

Seasonal Precipitation, October 2004 - March 2005

(Averaged by Hydrologic Unit)

% Average



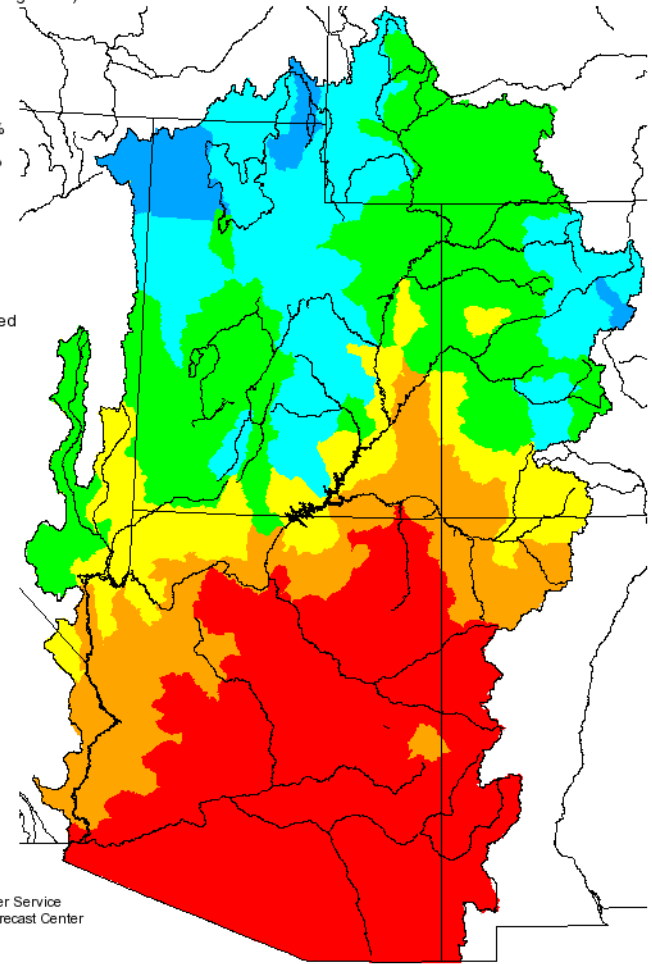
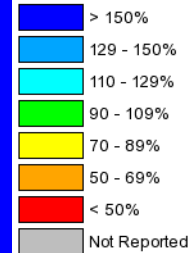
Prepared by
NOAA, National Weather Service
Colorado Basin River Forecast Center
Salt Lake City, Utah
www.cbrfc.noaa.gov

This Year

Seasonal Precipitation, October 2005 - March 2006

(Averaged by Hydrologic Unit)

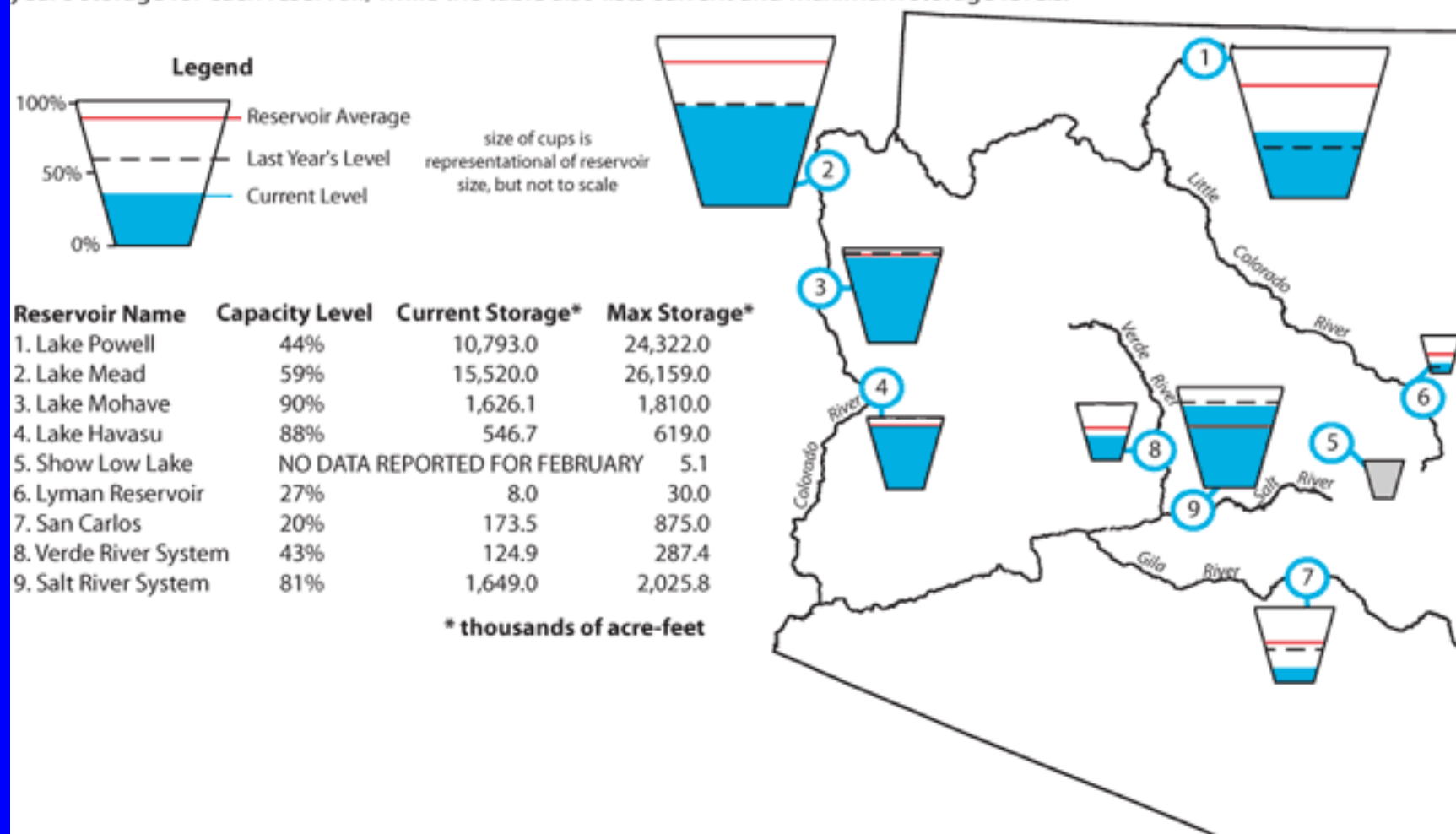
% Average



Prepared by
NOAA, National Weather Service
Colorado Basin River Forecast Center
Salt Lake City, Utah
www.cbrfc.noaa.gov

Reservoir Status

Figure 5. Arizona reservoir levels for February 2006 as a percent of capacity. The map also depicts the average level and last year's storage for each reservoir, while the table also lists current and maximum storage levels.

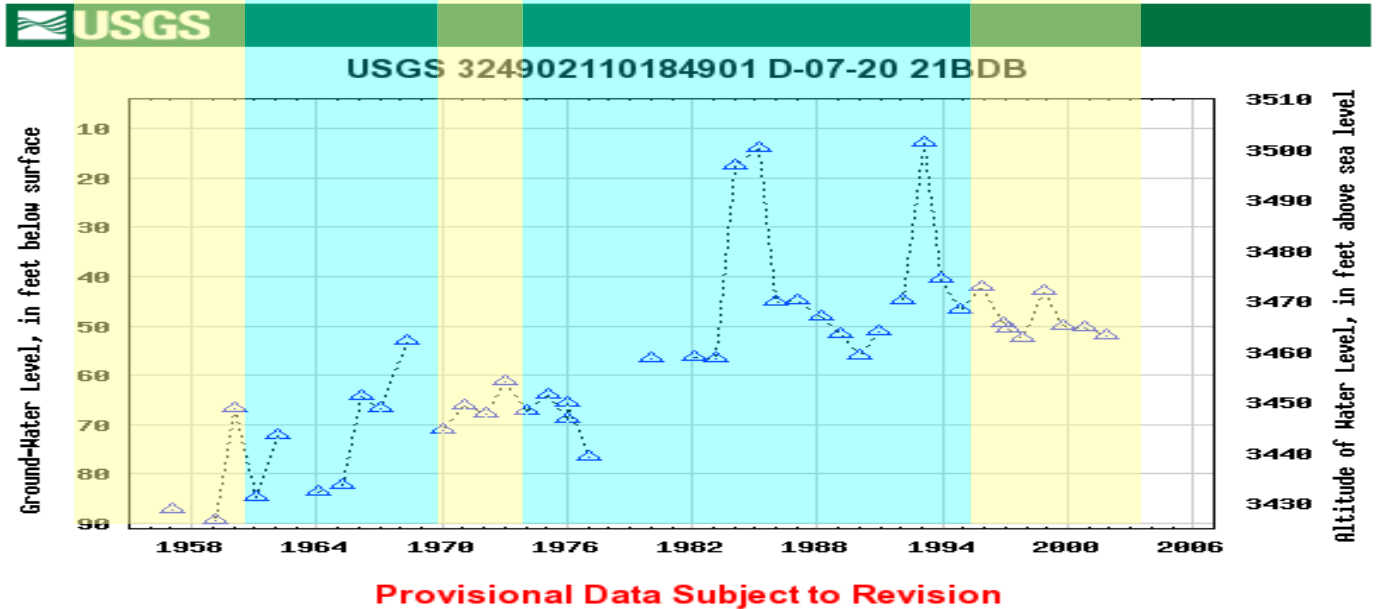
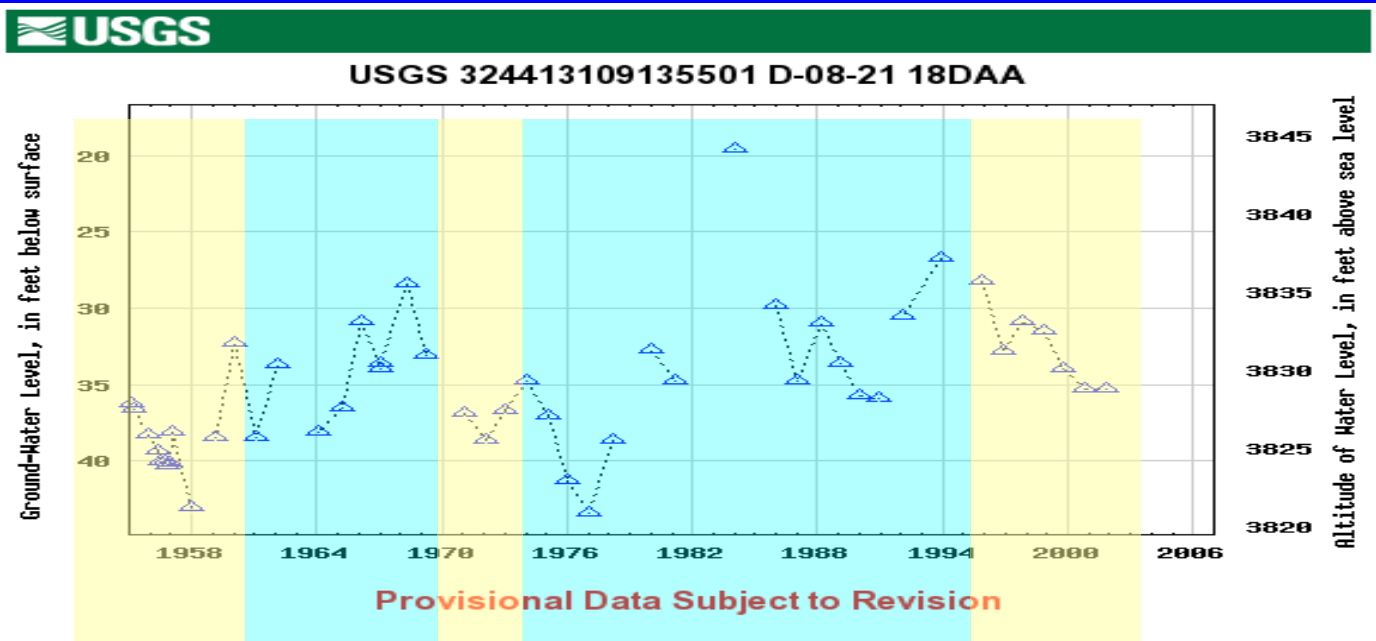


NRCS Snowpack Data

(April 1st)

Watershed	Percent of 30-Year Average
Salt River Basin	18%
Verde River Basin	18%
Little Colorado River Basin	18%
San Francisco-Upper Gila River Basin	28%
Chuska Mountains	30%
Central Mogollon Rim	17%
Grand Canyon	54%
San Francisco Peaks	39%
Arizona Statewide Snowpack	28%
Upper Colorado River Basin	102%

Ground-Water Levels



Wet

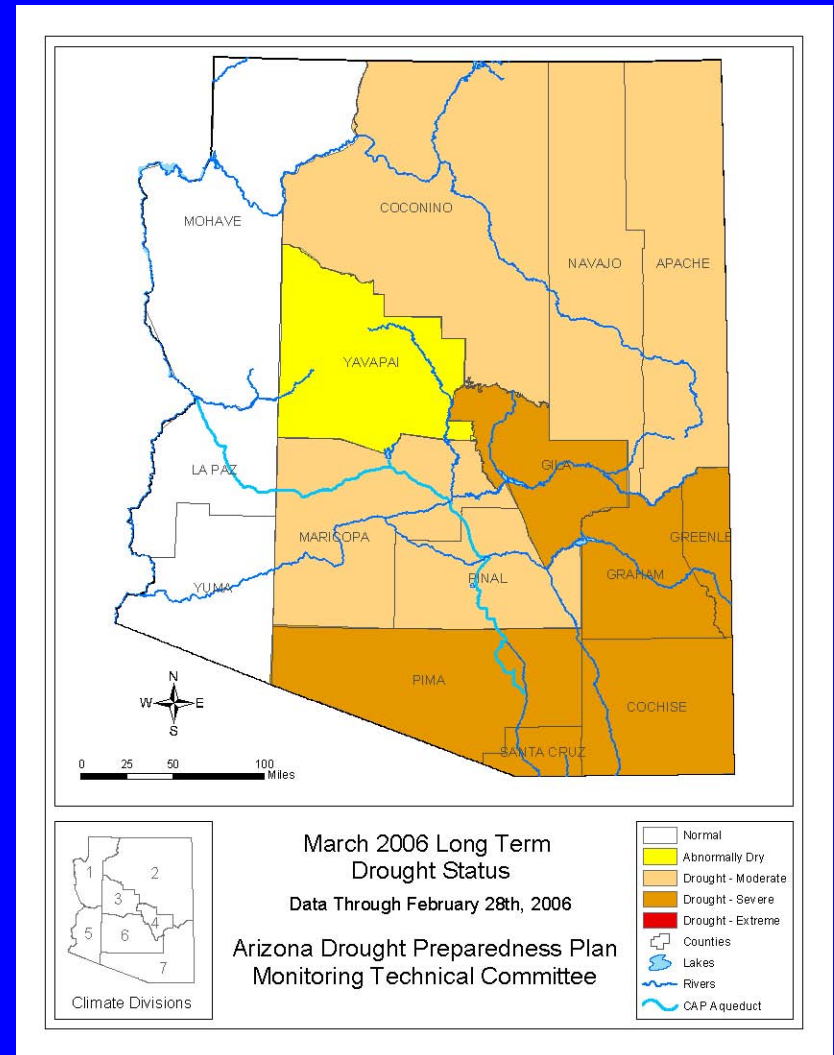
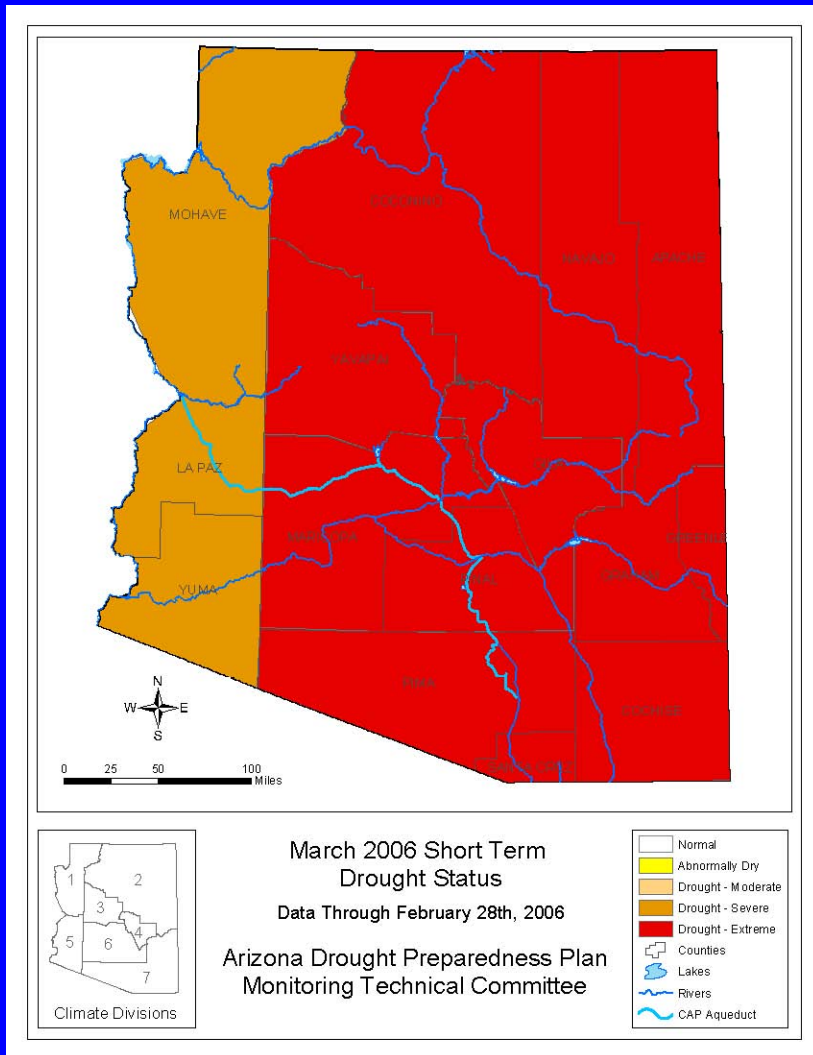


Dry



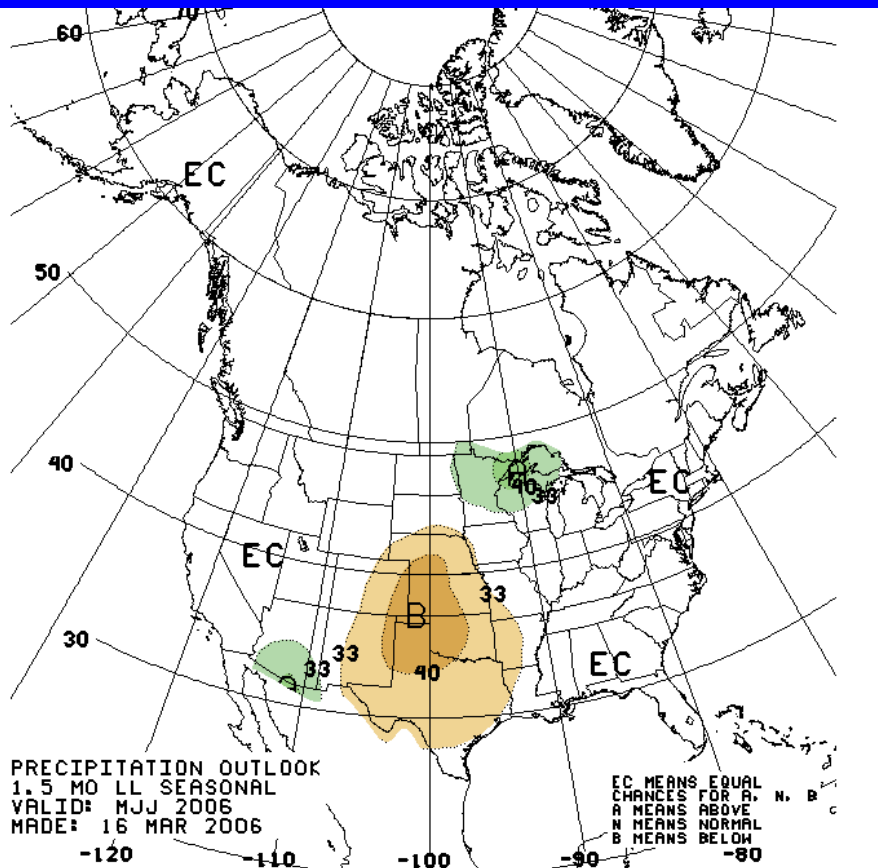
Aravaipa, AZ

March 2006 Status Maps

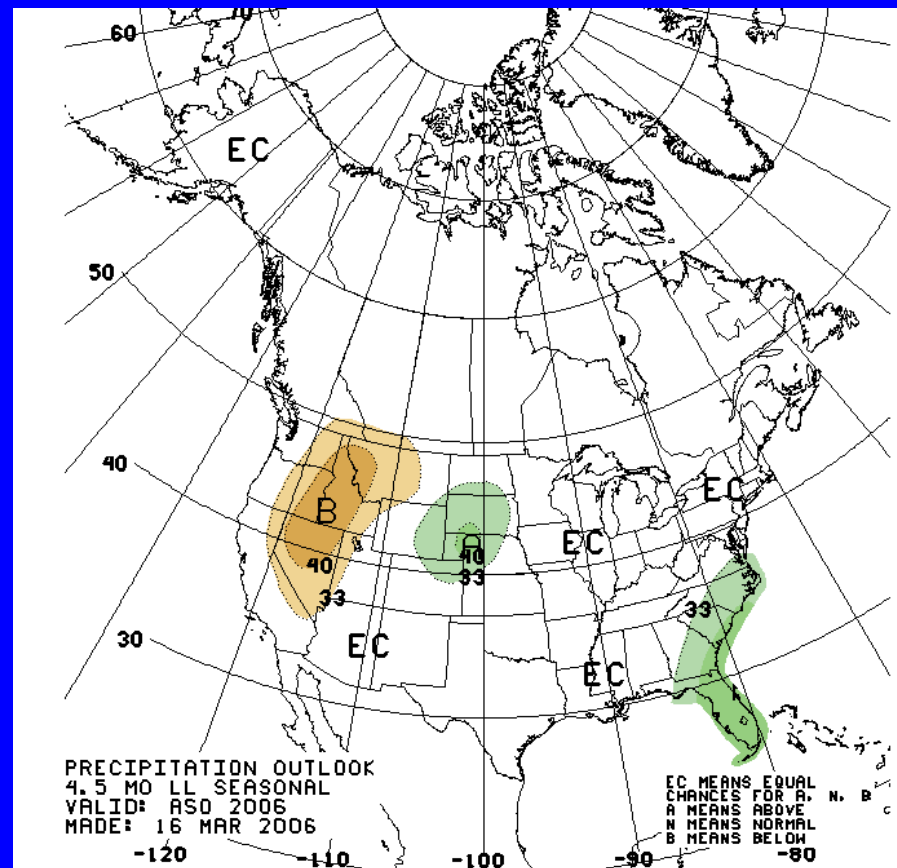


90-Day Precipitation Outlooks

May through July



August through October



Streamflow Forecasts

(Preliminary)

Watershed	% of Median
Salt River near Roosevelt	21
Tonto Creek near Roosevelt	19
Verde River - Horseshoe Dam	46
San Francisco River at Clifton	29
Gila River near Soloman	29
San Carlos reservoir inflow	26
Little Colorado - Lyman Lake	8
Little Colorado River - Woodruff	7
Colorado Inflow to Lake Powell	96
Virgin River at Littlefield	54



U.S. Seasonal Drought Outlook

Through June 2006

Released March 16, 2006



Temporary improvement
early followed by
drought persistence

Improvement

Some improvement
early in the period

Persist

Development
Possible

Improvement
early in the period

KEY:

-  Drought to persist or intensify
-  Drought ongoing, some improvement
-  Drought likely to improve, impacts ease
-  Drought development likely

Depicts general, large-scale trends based on subjectively derived probabilities guided by numerous indicators, including short- and long-range statistical and dynamical forecasts. Short-term events – such as individual storms – cannot be accurately forecast more than a few days in advance, so use caution if using this outlook for applications – such as crops – that can be affected by such events. "Ongoing" drought areas are approximated from the Drought Monitor (D1 to D4). For weekly drought updates, see the latest Drought Monitor map and text. NOTE: the green improvement areas imply at least a 1-category improvement in the Drought Monitor intensity levels, but do not necessarily imply drought

Corroborative Data

Two Step Process

- Calculated Drought Status
- Consult additional data sources, in order to corroborate Drought Status and add spatial precision

Examples:

- Snowpack Reports
- Range and Pasture Status Reports
- Status of Springs, Seeps, Ponds
- Satellite Vegetation Health
- Wildlife Population Statistics

Local Area Impact Assessment Groups

LAIAGs *can* (must!) contribute:

- Current Conditions
- Credible Information on Local Impacts
 - Impacts provided to decision-makers
- Precipitation Totals through Volunteer Rain Gage network
 - Spatial variability
- Other Hydroclimatic Conditions, e.g. Wind
- Verification

Future Work

Increased resolution

- Watershed-level Drought Status
- *Blending short-term obs with long-term obs*

Ongoing Trigger/Indicator Evaluation

- *Local Area Impact Assessment Group Reports*
- *Retrospective assessment with impacts database*

Coordination with

- *AZ Multi Agency Flood Task Force*
- *NM and other bordering states*

Drought Monitoring Technical Committee Recommendations

- Be “*Droughtwise*” (Think Dry)
- Stay Current on Weather Outlooks
- Reduce Water Consumption whenever possible
- Continue the Drought Emergency